

# Definitions of Feed Manufacturing and Livestock Nutrition Terms

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## Factsheet

ORDER NO. 08-039

AGDEX 400/50

JULY 2008

(replaces OMAFRA Factsheets *Livestock Feed Terms Defined*, Order No. 92-017 and *Feed Processing and Manufacturing Terminology*, Order No. 92-052)

This Factsheet is designed to provide the reader with definitions of terms used in nutrition-related articles, feed analysis reports and feed tags. The following list of terms is provided for information purposes only. In the event of overlap in the terminology defined here and that used elsewhere, the legal definition should be used. Use of trade names does not constitute endorsement of the product.

**Acid detergent fibre (ADF)** – a chemical analysis that determines the amount of residue (primarily cellulose, lignin and variable amounts of silica) remaining after boiling a feed sample in an acid detergent solution. The ADF value is used to predict the energy content (TDN, NE) of forages.

**Acid detergent fibre-crude protein (ADF-CP)** – a laboratory test used to measure the amount of heat damaged protein in hay and haylage, reported on a crude protein basis (nitrogen content multiplied by a factor of 6.25 to convert nitrogen content to a crude protein equivalent basis).

**Acid detergent fibre-nitrogen (ADF-N)** – a laboratory test used to measure the amount of heat damaged protein in hay and haylage. The nitrogen (as protein) in this form is unavailable to the animal.

**Acid detergent insoluble nitrogen (ADIN)** – see *Acid detergent fibre-nitrogen*.

**Ad libitum (ad lib)** – a diet offered free-choice, allowing animals to eat as much as they desire; typically allows for 10% leftover from a daily allotment.

**Amino acids** – a class of nitrogen-containing molecules that are the building blocks from which protein is made in the body.

**Ammoniated** – combined or impregnated with ammonia or ammonium compounds.

**Anthelmintic** – drug used to control infections of multi-celled parasitic worms (examples of helminthes: flukes, tapeworms, roundworms), commonly known as a wormer.

**Antibiotic** – a class of drug usually produced by living organisms (moulds, bacteria or green plants) that can inhibit or kill undesirable bacteria (e.g., penicillin).

**Anticoccidial** – see *Coccidiostat*.

**Antioxidant** – a compound added to feeds to prevent the oxidative rancidity of fats.

**As fed** – an expression of feed nutrient content with moisture included. Nutrient content on an “as fed” basis is always lower than on a “dry matter” basis.

**Ash** – the inorganic mineral elements of animals and plants, determined in a laboratory by burning off the organic matter at a high temperature and weighing the residue (ash).

**Available protein** – the portion of the crude protein that can be digested by the animal; it can represent the proportion of total protein after deducting the ADF-N fraction of a feed.

**Average daily gain (ADG)** – the average daily liveweight increase of a growing animal, usually expressed in kilograms, grams or pounds/day.

**Balanced ration** – a 24-hour feed allowance that provides an animal with appropriate amounts and proportions of all nutrients required for a given level of performance.

**Beta carotene** – a pre-cursor of vitamin A provided by green pigment in forages that can be added in a synthetic form to feed mixtures. Claims include improved reproductive efficiency and decreased uterine and mammary infections in dairy cows.

**Blended** – [two or more feed ingredients] combined; blending does not imply a uniformity of dispersion.

**Block** – one or more feeds compressed into a solid form, usually weighing 15–25 kg.

**Bran** – coarse outer grain coating, separated during processing.

**Browse** – small stems, twigs, leaves and/or fruits and flowers of shrubs, woody vines and trees.

**Buffer** – a substance used in livestock rations to help resist changes in the acidity of the digestive tract (e.g., sodium bicarbonate, bentonite).

**By-pass protein** – see *Rumen-undegradable protein*.

**Byproduct** – feed ingredients produced as a result of industrial manufacturing, plant or animal processing (e.g., distillers' grains, beet pulp, fish meal).

**Cake** – residue remaining after pressing seeds, meat or fish to remove oil, fat or other liquid.

**Carbohydrate** – energy-providing substrate, including starches, sugars, cellulose and hemicellulose. All carbohydrates contain carbon, hydrogen and oxygen, and are usually divided into two fractions: structural (fibre from plant cell wall) and non-structural (sugars and starches from plant cell contents).

**Carrier** – an edible material to which ingredients are added, facilitating uniform distribution of the ingredients into a feed mixture.

**Cellulose** – a fibrous carbohydrate that is the chief part of plant cell walls.

**Chaff** – husks or other seed coverings and other plant parts separated from seed during harvest or processing.

**Chelated mineral** – a compound formed between an organic molecule and a mineral that increases mineral bioavailability to the animal, which can reduce excretion of excess minerals in manure.

**Chemical analysis** – the use of standard chemical analytical procedures to determine the composition of a feed.

**Choline** – an essential nutrient, not strictly a vitamin by definition, closely associated with fat metabolism and transport, commonly added to swine and poultry rations. Ruminants generally synthesize adequate amounts, but choline may be added to diets of early lactation dairy cows.

**Chopped** – [particle size] reduced by cutting with sharp-edged instruments (e.g., knives).

**Cleaned** – cleared of undesired materials by screens, magnets or forced air.

**Coccidiostat** – drug used to control coccidial infections. Coccidia are microscopic protozoa that live in the intestinal lining of livestock and poultry, causing severe diarrhea or unthriftiness.

**Colostrum** – the first milk secreted by mammals after giving birth, particularly rich in nutrients and antibodies essential for newborn survival through passive transfer of immunity to the calf from the mother.

**Complete feed** – a thoroughly blended mixture of different feed ingredients formulated to meet specific nutrient requirements that allows for greater efficiency in feeding and provides better control of nutrient intake. A complete feed may or may not include the roughage portion of the ration.

**Concentrate** – a classification of feedstuffs high in energy and low in fibre, usually further divided into energy and protein concentrates. Often used interchangeably with supplement (e.g., corn, barley, soybeans).

**Condensed** – reduced to a denser form by removing moisture.

**Condensed distillers' solubles** – the liquid portion or “syrup” that has been separated from the residual fermentation stillage or mash, with a portion of its water content evaporated. The solubles usually contain 25%–30% dry matter and are often re-combined with the corn distillers' grains to form corn distillers' grains with solubles.

**Conjugated linoleic acid (CLA)** – a variety of positional and geometric isomers of linoleic acid naturally formed in the rumen through the biohydrogenation of linoleic acid by rumen bacteria. Consumption of meat and milk containing CLA has been linked to potential health benefits in humans.

**Coproducts** – see *Byproduct*.

**Corn distillers' grains** – the residual grains or byproduct that contain the nutrients remaining after the starch from corn has been fermented to alcohol. The concentration of these residual nutrients is approximately 3x that found in the original corn.

**Cracked** – [particle size] reduced by a combined breaking and crushing action.

**Crimped** – [feed] rolled using grooved rollers.

**Crude fibre (CF)** – chemical analysis that involves extraction of a ground feed sample with diethyl ether followed by sequential boiling in dilute acid and dilute base. Residue is then burned in a furnace; CF is calculated as the difference in weight of the sample before and after burning. CF has been replaced by ADF and NDF fibre fractions in ruminant feeds but is still reported for monogastric feeds.

**Crude protein** – an estimate of the total protein content of a feed determined by analyzing the nitrogen content of the feed and multiplying the result by 6.25. Crude protein includes true protein and other nitrogen-containing substances such as ammonia, amino acids, nitrates.

**Crumbles** – pelleted feed that has been broken into smaller granular pieces.

**Cubes** – long or coarsely cut hay compressed into high density cubes to facilitate transportation, storage and feeding.

**Cured** – [feed] preserved by drying, chemical additives or other preservation methods.

**Degradable intake protein (DIP)** – see *Rumen-degradable protein*.

**Degradable protein** – see *Rumen-degradable protein*.

**Dehulled** – [grains, fruit or nuts] free of seed coats or outer shells.

**Dehydrated** – dried by removing moisture.

**Digestibility** – a measure of the apparent extent that a feed or nutrient is digested, usually expressed as a percentage of the amount consumed.

**Digestible energy (DE)** – the apparent energy that is available to the animal by digestion, measured as the difference between gross energy content of a feed and the energy contained in the animal's feces (gross energy minus fecal energy).

**Digestible NDF (NDFd)** – a measure of how digestible the neutral detergent fibre fraction of forages is in ruminants. NDFd provides a better estimate of feed value than reliance only on measures of lignin and acid detergent fibre.

**Digestion** – the process of mechanical, chemical and enzymatic breakdown of consumed feeds into smaller components for absorption in the intestine of the animal.

**Direct-fed microbial (DFM)** – a live microbial feed supplement that beneficially affects the host animal. Claims include reduced early mortality, increased growth rate, improved feed conversion, egg quality and animal health (e.g., prevent disease and/or aid recovery from illness). Lactic acid producing strains (e.g., *Lactobacillus* and *Streptococcus*) are common components of bacterial DFMs.

**Drug** – substance of synthetic, mineral, plant or animal origin used for pain relief or cure of disease and not as a nutrient.

**Dry matter** – feed residue left after all moisture has been removed by drying (e.g., 100% dry matter).

**Dry-matter basis** – used to compare nutrient composition or animal intake of feeds in a standardized fashion by eliminating differences in moisture content.

**Dry-matter intake** – amount of moisture-free feed or diet consumed.

**Effective NDF** – a measure for ruminant animals of the amount of neutral detergent fibre (NDF) above a minimum feed particle size in their diet.

**Emulsifier** – a substance added to products to enable fat or oil to remain in liquid suspension; it is commonly added to milk replacers to prevent fat from separating.

**Endosperm** – starchy portion of seed.

**Escape protein** – see *Rumen-undegradable protein*.

**Ensiled** – [plant materials] preserved by anaerobic fermentation and typically stored in a bag, bunker or upright silo.

**Enzyme** – a complex protein produced by living cells that speeds up chemical reactions without being changed or destroyed itself. Enzymes are added to animal feeds to supplement low enzyme production or to improve utilization of poorer quality feeds.

**Essential amino acid** – amino acids that must be supplied in the diet, as the animal either cannot synthesize them at all or cannot synthesize them in sufficient quantities to meet its requirements.

**Essential fatty acid** – fatty acid that cannot be synthesized by an animal from other sources. Linolenic (18:3n3) and linoleic acid (18:2n6) are essential in the diet; these fatty acids are the basis for the omega-3 and omega-6 classes of fatty acids and are building blocks for longer-chain fatty acids. Fatty acid deficiencies are unusual but can affect skin, coat and reproductive performance.

**Estimated crude protein from non-protein source (ECP from NPS)** – non-protein nitrogen source, such as urea or ammonia; used in ruminant diets in limited amounts to enhance dietary protein levels.

**Ether extract** – laboratory test to approximate the total fat content of a feed; includes some waxes, pigments and other lipids to a minor degree.

**Expanded** – [grain kernels] swollen to several times their original size by first steaming under pressure to force moisture into the kernels, and then exposing to air.

**Extracted** – [fat or oil] removed from a feed or byproduct by heat and mechanical pressure (mechanically extracted) or by organic solvent (solvent extracted).

**Extruded** – [feed] forced through narrow openings under pressure.

**Fat-soluble vitamins** – includes vitamins A, D, E and K. Fat-soluble vitamins are stored in body fat reserves. Vitamins A, D and E are supplemented in many livestock rations.

**Fatty acid** – a major component of fat that is used for energy by the animal. Molecules are composed of carbon and hydrogen in chain-like formation.

**Feed efficiency** – a ratio describing the amount of feed consumed per unit of production (e.g., gain, milk, eggs).

**Feed grade** – term to describe the quality of feedstuffs suitable for animal, but not human, consumption.

**Feed processing** – physical or chemical changes in feedstuffs, which influence their nutritional value.

**Fermented** – [feed] subjected to an aerobic or anaerobic process in which yeast, moulds or bacteria act to produce alcohol, acids, B complex vitamins or antibiotics.

**Fibre** – see *Structural carbohydrate*.

**Fines** – any materials that pass through a screen whose openings are immediately smaller than the specified minimum particle size.

**Flaked** – [feed] rolled or cut into flat pieces with or without prior steam conditioning.

**Flour** – soft, finely ground meal consisting mainly of starch and gluten obtained during grain milling.

**Flushing** – 1. The practice of increasing a female animal's energy intake prior to and during the breeding season; may increase conception rate and/or litter size. 2. A process to clean feed-mixing equipment to reduce remaining traces of feeds or additives left over from prior use.

**Forage** – plants or plant parts fed to, or grazed by, domestic animals. Forage may be fresh, dry or ensiled (e.g., pasture, green chop, hay, haylage).

**Formula feed** – two or more ingredients combined, mixed and processed according to specifications.

**Functional feed** – a feedstuff specifically used because of its nutrient composition to enhance dietary content and potentially influence the nutrient content in livestock products (e.g., milk, meat, eggs).

**Germ** – the seed embryo.

**Gluten** – tough nitrogen containing substance remaining after the flour is washed free of starch.

**Grain** – seed from cereal plant (e.g., oats, corn, wheat).

**Gram (g)** – 1/1,000 of a kilogram (kg) or 1/28 ounce (28 grams = 1 ounce). It is a small unit of weight.

**Grits** – coarsely ground grain from which the bran and germ have been removed.

**Groats** – cereal seeds with hulls removed.

**Gross energy (GE)** – laboratory analysis that measures the total combustible energy in a feed. It is determined by the amount of heat produced when a feed sample is completely burnt in a bomb calorimeter.

**Ground** – particle size reduced by mechanical shearing, wearing or impact.

**Hay additives** – organic acids or acid-forming compounds designed to allow hay to be harvested at higher than normal moisture contents by preventing the microbial activity responsible for spoilage.

**Heat damage** – reduction in nutrient content of a feed because of chemical reactions induced by high temperatures. *Maillard reaction* refers to loss of amino acid availability as it complexes with carbohydrates.

**Heat-damaged protein** – reduction in protein content of feedstuff that is available to the animal because of chemical reactions that occur at high temperatures. See *heat damage*.

**Hemicellulose** – a polysaccharide found in plant cell walls that is more complex in structure than sugars but less complex than cellulose.

**International unit (IU)** – a standard unit of potency of a biological agent (e.g., vitamin, hormone, antibiotic, antitoxin); also called a USP unit in the U.S.

**Iodized** – treated with iodine or iodide.

**Ionophore** – a carboxylic polyether antibiotic that affects ion transport across cell membranes, inhibits the growth of some gram-positive bacteria and promotes animal growth. Depending on the level fed, an ionophore may also act as a coccidiostat. Three ionophores are currently registered for use in Canada:

Lasalocid sodium – trade names: Bovatec, Avatec

Monensin sodium – trade names: Rumensin, Coban

Salinomycin sodium – trade names: Posistac, Coxistac

**Irradiated** – [feed] treated, prepared or altered by exposure to a specific level and duration of radiation.

**Kilo** – a prefix used in the metric system of measurement to represent 1,000 (e.g., 1 kilogram (kg) = 1,000 grams, 1 kilojoule (KJ) = 1,000 joules).

**Lignin** – a complex polymer bound to cellulose that strengthens plant cell walls but is indigestible to animals.

**Lipids** – substances found in plant and animal tissues that are insoluble in water, but soluble in benzene or ether; includes glycolipids, phosphoglycerides, fats, oils, waxes and steroids.

**Liquid feed** – a feed with a high water content, (e.g., 2:1 water:feed).

**Liquid protein supplement (LPS)** – a protein product usually containing molasses, urea, added vitamins and trace minerals. It is particularly useful in pasture feeding.



**Lysine** – an essential amino acid for protein synthesis. It is the first limiting amino acid in corn-soybean-based swine diets. Can be added in a synthetic form to diets.

**Macrominerals** – minerals required in relatively large amounts by livestock. Includes calcium (Ca), phosphorus (P), magnesium (Mg), potassium (K), chlorine (Cl), sulfur (S) and sodium (Na).

**Marine oils** – oil extracted from fish or algae, particularly rich in long-chain fatty acids that have health benefits.

**Mash** – a mixture of ingredients in meal form.

**Meal** – a feed ingredient having a particle size similar to flour.

**Medicated feed** – any feed that contains drug ingredients intended for the cure, treatment or prevention of animal disease, enhancement of feed efficiency or promotion of growth.

**Mega** – a prefix used in the metric system of measurement to represent 1 million (e.g., 1 megacalorie (Mcal), 1,000,000 calories).

**Melengestrol acetate (MGA)** – a hormone added to diets to suppress estrus cycling and improve feed efficiency and growth rate in feedlot heifers. It is not to be used in animals kept for breeding purposes.

**Metabolizable energy (ME)** – a measure of the useful energy in a feed, representing that portion of the feed gross energy not lost in the feces, urine and eructated gas.

**Metabolizable protein** – in ruminants, this represents the sum of protein and amino acids reaching the small intestine from ruminally undegraded protein and microbial protein supply.

**Methionine** – a sulfur-containing essential amino acid for protein synthesis; a limiting amino acid in many ruminant diets. Protected-methionine means resistant to rumen digestion.

**Micro** – a prefix used in the metric system to represent 1/1,000,000.

**Micro-ingredient** – a vitamin, mineral, antibiotic, drug or other compound normally required in small amounts and added to diets in milligrams or micrograms.

**Micromineral** – minor mineral elements required fed in very small amounts in the ration of animals; includes manganese (Mn), copper (Cu), zinc (Zn), selenium (Se), iron (Fe), cobalt (Co), iodine (I) and fluorine (F).

**Micronized** – [feed] subjected to dry heat by microwaves emitted from infrared burners, followed by rolling.

**Middlings** – a byproduct of milling, it consists of granular particles containing differing proportions of the grain, endosperm, bran and gluten.

**Milk replacer** – a substitute for fresh whole milk, fortified with vitamins and minerals: used as a nutrient source for young animals.

**Mill byproduct** – a secondary product obtained in addition to the principal milling product.

**Mill dust** – fine feed particles of unspecified origin resulting from feed handling and processing.

**Milli** – a prefix used in the metric system of measurement to represent 1/1,000 (e.g., 1 mg = 1/1,000 g).

**Mineral supplement** – a rich source of one or more mineral elements.

**Minerals** – inorganic feed elements essential for life.

**Mixed** – [feeds] combined by agitation to a specified degree of dispersion.

**Moisture free** – see *Dry matter*.

**Monogastric** – having a single or simple stomach system (e.g., swine).

**Mycotoxin** – a substance produced on plants by fungi, particularly during weather stress during the growing or harvest seasons, that is toxic to animals (e.g., vomitoxin, zearalenone, aflatoxin and T-2).

**National Research Council (NRC)** – a scientific body in the U.S. that has regularly published nutrient requirements for animals based on the latest available research.

**Near-infrared analysis (NIRA)** – a laboratory analysis of feeds that uses a specific wavelength of near infrared light to estimate nutrient content of feeds based on computerized calibrations of nutrient composition of feedstuffs; a lower-cost analysis compared with traditional wet chemistry. It is dependent on correct calibration to specific feeds for accurate analysis.

**Near-infrared spectroscopy (NIRS)** – see *Near-infrared analysis*.

**Net energy (NE)** – the amount of feed energy actually available for animal maintenance and production, representing the energy fraction in a feed left after fecal, urinary, gas and heat losses are deducted from the gross energy value of a feed. Net energy can be further partitioned into the net energy necessary for maintenance, growth and lactation.

**Neutral detergent fibre (NDF)** – the insoluble fraction containing all plant cell wall components left after boiling a feed sample in a neutral detergent solution. NDF is of low digestibility but can be broken down somewhat by the digestive tract microorganisms. NDF value is used to predict ruminant feed intake.

**Niacin** – a water-soluble B vitamin involved in the metabolism of carbohydrates, lipids and proteins. It is essential in monogastric diets but not for ruminants and non-ruminant herbivores. Niacin has a beneficial role in controlling energy use and ketosis in dairy cattle, especially in early lactation.

**Nitrate percent ( $\text{NO}_3\%$ )** – a minor component of the nitrogen-containing fraction of feed. Nitrate levels can increase in a crop that has been subjected to drought (specifically after a rainfall), hail, frost or high levels of nitrogen fertilization. Feeds having greater than 1% nitrate can be toxic to ruminants.

**Non-essential amino acids** – amino acids that can be synthesized by the animal.

**Non-fibre carbohydrate** – see *Non-structural carbohydrate*.

**Non-protein nitrogen (NPN)** – nitrogen not derived from true protein, but usable by rumen microbes to build microbial protein, (e.g., urea).

**Non-structural carbohydrate (NSC)** – simple carbohydrates, such as starches and sugars, stored inside the cell that serve as a cellular energy source. Non-structural carbohydrates are rapidly and easily digested by the animal.

**Nutrient allowances** – recommendations for the nutrient amounts necessary for maintenance, growth, gestation, lactation or performance that include a safety margin to account for variability in feeds and animals (e.g., environment, health, storage losses).

**Nutrient requirements** – the minimum amounts of nutrients (energy, protein, minerals and vitamins) necessary to meet an animal's needs for maintenance, growth, reproduction, lactation or work; does not include a margin of error in ration formulation.

**Omega-3 fatty acid** – the family of fatty acids based on the presence of a double bond in the 3<sup>rd</sup> carbon from the methyl end of the molecule. Linolenic acid (18:n3n) is an essential omega-3 fatty acid because it cannot be synthesized by mammals.

**Omega-6 fatty acid** – the family of fatty acids based on the presence of a double bond in the 6<sup>th</sup> carbon from the methyl end of the molecule. Linoleic acid (18:2n6) is an essential omega-6 fatty acid because it cannot be synthesized by mammals.

**Organic matter** – total weight of the feed minus the mineral content.

**Palatability** – the appeal and acceptability of feedstuffs, including the taste, odour, texture and temperature of the feed.

**Particle size** – the diameter of granular feed materials (e.g., grains, pellets, mineral particles) and/or the length of roughage fragments. Particle size can affect mixing of feed ingredients and digestion rate.

**Parts per million (ppm)** – a measurement used for nutrients present in very small quantities (e.g., microminerals); ppm = milligrams per kilogram (mg/kg) or millilitre per litre (mL/L).

**Pearled** – [dehulled grains] reduced to smaller smooth particles by machine brushing or abrasion.

**Pelleted** – [feed] compressed into a circular or cubic mass, forced through die openings by a mechanical process and cut at predetermined lengths.

**pH** – a scalar measure of acidity or alkalinity. Values range from 0 (most acidic) to 14 (most alkaline or basic). A pH value of 7.0 is neutral (neither acidic nor alkaline).

**Physically effective NDF (peNDF)** – that fraction of neutral detergent fibre (NDF) that stimulates chewing; calculated as the product of NDF content and physically effective factor (measured as a proportion of dry matter retained on a 1.18-mm sieve after vertical shaking. High fibre and coarse feeds have higher peNDF values. The minimum peNDF suggested for lactating dairy cattle rations is 22%.

**Phytase** – a feed-additive enzyme that is capable of releasing a matrix of minerals (especially phosphorus) from phytic acid, which is a naturally present mineral-rich component of plant cells indigestible to monogastric animals. Used to reduce the amount of supplemental nutrients fed to meet animal requirements.

**Polyunsaturated fatty acid** – typical structure of vegetable oils that have double bonds in the molecular structure. These oils are characterized by being liquid at room temperature.

**Pomace** – see *Pulp*.

**Popped** – improved appearance and palatability [of beans] via a commercial process promoted as a method to improve protein digestion.

**Prebiotic** – a non-digestible feed ingredient that beneficially affects the animal by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon.

**Premix** – a uniform mixture of one or more microingredients and a carrier, used to facilitate uniform dispersion of micronutrients into a larger mixture. A mineral premix contains higher fortification of trace minerals and vitamins than a mineral supplement.

**Preservative** – a substance added to protect, prevent or retard decay, discolouration or spoilage of a substance during storage or use.

**Probiotic** – see *Direct-fed microbial*.

**Protected fat** – a fat that has been treated or combined with another substance to prevent its breakdown by microorganisms in the rumen.

**Protein** – naturally occurring compounds containing nitrogen, carbon, hydrogen and oxygen, and sometimes sulfur or phosphorus. Proteins are made up of complex combinations of amino acids and are essential for animal growth, production and reproduction.

**Protein supplement** – a feed or mixture of feeds containing 20% or more protein or protein equivalent (e.g., soybean meal, canola meal).

**Pulp** – solid residue remaining after juice extraction from fruit, vegetables, roots or stems (e.g., apple pomace, beet pulp).

**Ration** – the 24-hour feed allowance for an individual animal.

**Relative feed value** – a standardized measure of forage quality calculated from acid detergent and neutral detergent fibre contents. Forage with NDF values of 53% and ADF values of 41% represent a value of 100. Forages with values greater than 100 are of higher quality, and forages with a value lower than 100 are of lower quality. Dry matter intake (DMI) and digestible dry matter (DDM) values of forages can be used to calculate RFV or use the formula with ADF and NDF values.

$RFV = (\%DDM \times \%DMI) / 1.29$  or

$RFV = [(88.9 - 0.78 \times ADF\%) \times (120/NDF\%)] / 1.29$

**Rendering** – removing and/or clarifying one substance (e.g., fat, water) from another, either through the use of heat or by pressing and draining a solid residue of cooked material.

**Roasted** – [feed] heated to a desired temperature in an oven for a period of time. Roasting increases the availability of carbohydrates and may reduce protein breakdown in the rumen.



**Rolled** – [grain] passed between a set of rollers, splitting the coarse outer grain shell.

**Roughage** – feed high in fibre (greater than 18% crude fibre); tends to be bulky, coarse and low in energy. See *Forage*.

**Rumen-degradable protein** – portion of ingested protein that is susceptible to digestion by rumen microorganisms; used in the synthesis of microbial protein

**Rumen-undegradable protein (RUP)** – the portion of ingested protein that resists rumen degradation and is digested directly in the other stomachs or small intestine; generally a more expensive source of protein.

**Saturated fat** – a completely hydrogenated fat, solid at room temperature (e.g., animal tallow).

**Scratch** – whole, cracked or coarsely cut grain.

**Screenings** – small, imperfect kernels, broken grains, hulls, weed seeds and other foreign material obtained from the cleaning of grain.

**Shredded** – similar to chopped, except feedstuffs are cut longitudinally rather than cross-wise.

**Silage additives** – substances added during the ensiling process to enhance the correct and rapid fermentation of the feed.

**Silage** – feed preserved by an anaerobic fermentation process (e.g., corn silage, haylage, high moisture corn). See *Ensilage*.

**Soluble intake protein (SIP)** – portion of the protein intake that is completely soluble in rumen fluid and rapidly utilized by bacteria. Soluble protein forms part (or all) of the degradable intake protein (DIP) value of a feed.

**Soluble protein** – an older laboratory measurement that represents the portion of crude protein that goes into solution when mixed in a buffered solution. If 30% of the protein goes into solution, by definition, 30% of the crude protein is soluble.

**Starch** – a carbohydrate that is a polymer of glucose. Mixture of amylose and amylopectin; represents a store of energy for plants.

**Steamed** – [ingredients] treated with steam to alter physical and/or chemical properties.

**Steamflaked** – processing technique for cereals that subjects the grain to steam under atmospheric conditions for usually 15–30 min, before rolling. Heavy roller mills make the grain completely flat and rupture the cells, making the nutrients available more freely to the animal. Increases feed efficiency and rate of gain compared with feeding dry rolled cereals.

**Steeped** – [feed] soaked in water or other liquid.

**Structural carbohydrates** – complex carbohydrates including cellulose, hemicellulose, lignin and pectin that form the plant cell wall; measured in the laboratory as neutral detergent fibre (NDF). Also known as fibre.

**Supplement** – feed or feed mixtures used to improve the nutritional value of basal feeds. A supplement is rich in one or more of protein, energy, vitamins, minerals or antibiotics, and is combined with other feeds to produce a more complete feed. Often used interchangeably with concentrate.

**Sweet feed** – a commercial feed sweetened with molasses to improve palatability.

**Textured** – [ration] containing fine materials in a pelleted form, mixed with coarser ingredients.

**Total digestible nutrients (TDN)** – the energy value of feedstuffs, comparable to digestible energy in accuracy. TDN over-estimates the energy value of roughages in comparison to grains.

**Total mixed ration (TMR)** – homogenous mixture of mechanically mixed ration ingredients, including roughages. TMRs are commonly used in large dairy or beef feedlot operations.

**Toxicity** – the extent to which a substance is poisonous to animals.

**Trace minerals** – see *Micromineral*.

**Unavailable protein** – see *Heat-damaged protein*.

**Undegradable intake protein (UIP)** – see *Rumen-undegradable protein*.

**Unsaturated fat** – any fat that is not completely hydrogenated. Unsaturated fats are liquid at room temperature (e.g., corn oil, vegetable oil).

**Vitamin** – organic compounds that typically function as parts of enzyme systems essential for many metabolic functions.

**Wafers** – fibrous materials compressed into a form having a cross-section measurement greater than its length. Exact dimensions and bulk density of wafered feeds will vary according to the processing equipment used.

**Water-soluble vitamins** – sub-class of vitamins that includes B complex vitamins and vitamin C. Not normally supplemented for ruminants after 2 months of age because rumen microbes are thought to be able to manufacture enough to meet the animal's requirements.

**Wet chemistry** – laboratory methods used to determine nutrient content of feeds directly by chemical means.

**Wormer** – see *Anthelmintic*.

**Yeast** – single-cell fungi that improves feed digestion by stimulating microbial activity and stabilizing digestive tract pH. Products packaged as “yeast” consist of cells only; “yeast culture” includes live yeast cells plus growth media.

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ISSN 1198-712X  
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